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MIXING OF THE WATERS AT THE SNOC TROU BAR IN FLOOD PERIODS

by

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GEOGR.PHIC.L CONDITIONS

Before flowing into the Great Lake, the Tonlé Sap flows through a largely fossil deltaic formation: the Snoc Trou Bar. This where it is joined by one of the main tributary rivers of the Great Lake: the Stung Sen (see Table 1).

We only studied the Eastern part of the Bar, as it is the only section involved as far as the Stung Sen water is concerned and also because most of the water flows through it in flood periods.

.lmost parallel and oriented North-South, seven "preks"[1/] connect the Tonlé Kramon (as this part of the Tonlé Sap is called) with the Great Lake. Starting from the northernmost, they are: Preks T.SOM, R.TNAM, R.T TU, R.T B., R.T NHI, R.T NHUT, T.MEN - It should be added that Prek T.SOM is the only link with between the Tonlé Sap and the Great Lake in low water periods. Further south is the STUNG SEN, the mouth of which is encumbered by two islands.

To simplify things, we numbered the preks 1 to 7. Nos.8 and 9 are STUNG SEN and Tonlé Kramon, respectively.

1/ The word "Prek", in the Cambodian language, denotes a channel connecting the river with back ponds, or "beng". Here, the Great Lake is considered as the "Beng Thom" (Great Beng), the Tonlé Sap being the prek which connects it with the Me.eng river.

SAMPLINGS

On 11 July 1962, as the Tonlé Sap and the Stung Sen were at high flood level (reaching the 4 m 68 mark at the Snoc Trou gage) we took surface and bottom samplings of the water of the different preks, of the Stung Sen and the Tonlé Kramon (for the latter on both sides of the island facing Snoc Trou). The surface samplings were always taken 50 cm below the surface and the bottom samplings about 75-100 cm from the bottom.

Temperature was taken by means of a Métrix thermometric sounding device. The Institut Pasteur laboratory in Phnom-Penh tested the samples for the following: pH; resistivity, turbidity; dry residual matter at 100° C; suspended matter content; alcalinity; hardness; Ca^{++}; Fe^{++} .

The results of these tests are shown in table No.1.

RESULTS

The first striking fact is the great difference between the water of Tonlé Sap and the water of Stung Sen.

The Tonlé Sap water is characterized by a basic pH (7, 5-7, 6) and a comparatively low resistivity (7000 Ω/Cm^2). The Stung Sen water, on the other hand, has a slightly acid pH (6, 8-6, 9) and a great resistivity (34.500 Ω/Cm^2).

These characteristics are sufficient to tell the one water from the other, as they exist on the surface as well as near the bottom. The suspended matter content also differs greatly: it is much higher in the Stung Sen. Moreover, the latter has a very high suspended matter content gradient, which does not seem to be the case for the Tonlé Sap.

Alcalinity and hardness also are very different as well as the Ca content. The Stung Sen has almost three times more iron than the Tonlé Sap. Despite those very marked differences, it must be noted that the difference between 100° residual and suspended matter (which gives the dissolved salts content) is practically the same for the two rivers.

Let us straightaway observe that the seven preks through which the waters of the Tonlé Sap and the Stung Sen flow have physico-chemical characteristics the values of which are intermediate between those of the two rivers. Their water therefore is the result of certain mixing between the waters of these two rivers. The problem consequently is to determine the proportions of the mixing and whether the two types of water preserve their identity.

To illustrate this fact, we prepared charts in which the ordinates show the figures for the physical or chemical characteristics of the water, and the abscissae the different preks and the original waters. At both ends of the abscissae are plotted the measurements corresponding to the Tonlé Sap and the Stung Sen, respectively. Between them, the seven preks, beginning by the most distant, which is Prek Tasom (No.1).

If the mixing were perfect, the variation curve of each characteristic should be regular as one goes from the Tonlé Sap to the Stung Sen. The surface waters curve is coupled with the bottom waters curves (dotted line) see Fig 2

INTERPRETATION

The first fact resulting from an examination of the curves of the second chart is the small difference between the composition of the water of the Tonlé Sap (9) and the composition of the water of preks 1, 2, 3 and 4, whether at deep or surficial levels. Practically, allowing for the errors in analysis as well as for the comparative heterogeneousness of the waters in a vertical cross-section, because of turbulence, no water except that of the Tonlé Sap flows through those preks. The variation curves of alcalinity and hardness are significant in this respect.

At the other extremity of those curves, the same thing can be observed for preks 6 and 7 and the Stung Sen (8). Through these two preks, practically no other water than that of the Stung Sen seem to flow. Thus, as they come forth into the Tonlé Kramon, they form an almost closed loop to directly and individually join the Great Lake.

The case of prek 5 is more difficult. For the variation curves, at its level, instead of following the general pattern of the preceding sections, peak up towards values similar to those of the Stung Sen and sometimes even identical (especially as regards pH).

Things, in every respect, look as if the waters most closely reflecting the composition of those of the Stung Sen, instead of flowing through the two preks next to it, flowed through prek 5; in other words, that the Stung Sen stream followed a curve going from the mouth of the Stung Sen to the mouth of prek 5, and that the waters flowing preks 6 and 7 already were the result of a mixing.

CONCLUSIONS

The limited number of our analyses does not warrant any further deductions. One thing, however, seems certain: i.e. the individuality of the two waters arriving at the level of the Snoc Trou Bar. The water of the Stung Sen is pushed north by the Tonlé Sap and the two waters do not mix. Next, most of the Stung Sen water flows through prek RAT NHI (5).

These conclusions are valid only for the time at which this survey was conducted, for the respective hydrological conditions of the Stung Sen and the Tonlé Sap vary each year and often not synchronically: the Tonlé Sap flood depends upon the Mekong flood, whereas the Stung Sen flood depends on the more or less early arrival of the rainy season in the river watershed.

The time-lag between the respective floods of the two rivers is not always the same each year.

A late rainy season (1963), because it delays the Stung Sen flood, will give the advantage to the water of the Tonlé Sap and this flood will not be felt at the Snoc Trou Bar, because the influence of the water of the Tonlé Sap will be too great. Thus, the transfer of the Stung Sen water toward the Great Lake will take place further upstream from its mouth as the time-lag between the two flood increases.

This is very important; the obliteration of the Stung Sen water by the Tonlé Sap water at a greater or lesser distance from the Tonlé Kramon makes for or against the discharge of sand into the Snoc Trou Bar.

However, the fact which we brought into light in 1962 (flowing of the Stung Sen through prek 5) must be fairly usual and general, at least in the early stages of the flood; for we found during the low-water period of 1963 that at level of prek 5 there was across the Tonlé Kramon a silt bar about 1 m high. This bar can only be explained by the deposit, through flocculation, of suspended matter contained in the water of both rivers at the place of their confluence. This bar must in addition develop further during the ebbing of the water as a big fishing dam ("thos" in Cambodian language) is installed every year by the fishermen across the Tonlé Kramon at the level the island between preks 4 and 5.

The study of the bottom solid transport of the Stung Sen, started this year by the Vienna Atomic Energy Agency, will provide further precise data on the subject and will extend these results to the more specific problem of sand transport.

September 1st, 1963

J.P. CARBONNEL

Table No. 1
Tableau No. 1

ANALYSES PREKS		Temperature Température		p H		Resistivity Résistivité om		Turbidity Turbidité cm		Residue Résidu 100 °		Suspended matters Matières en suspension		Alcalinity Alcalinité Co_3Ca		Hardness Dureté Co_3Ca		Ca		Fe		Dissolved salts Sels dissous	
		Surf. Surf.	Bottom Fond	Surf. Surf.	Bott. Fond	Surf. Surf.	Bottom Fond	Surf. Surf.	Bott. Fond	Surf. Surf.	Bottom Fond	Surf. Surf.	Bottom Fond	Surf Surf	Bott Fond	Surf. Surf	Bott Fond	Surf. Surf.	Bottom Fond	Surf. Surf	Bott. Fond	Surf. Surf.	Bottom Fond
Prek TASOM	1	30°05	30°00	7,5	7,3	7.272	7.488	15	16	132	122,4	48	45,6	53	52	54	52	16,8	16	0,8	1,2	84	76,8
Prek RATNAM	2	29°90	29°90	7.3	7.1	8.352	9.216	15	11	151,2	175,2	66,4	97,6	48	45	50	44	16	12,8	0,7	1,4	84,8	77,6
Prek RAT TU	3	29°15	29°30	7,4	7,4	8.062	7.632	18	16	152	157,6	59,2	72	49	51	52	54	16	16,8	1,2	1,0	92,8	85,6
Prek RAT BA	4	29°20	29°20	7.2	7,3	7.992	7.920	14	15	160,8	162,4	72	77,6	49	49	50	50	16	16,2	0,9	1,3	88,8	84,8
Prek RAT NHI	5	29°20	29°20	6,8	6,9	15.840	14.400	14	14	199,2	199,2	121,6	117,6	27	30	28	30	8	8,8	1,5	1,4	77,6	81,6
Prek RATNHUT	6	29°20	29°20	7,1	7,1	9.720	10.368	14	15	170,4	163,2	84,8	86,4	41	38	42	38	12,8	12	1,2	1,2	85,6	76,8
Prek TAMEN	7	29°70	29°80	6,9	7,1	16.560	44.640	7	7	239,2	296	155,2	205,6	26	18	24	18	7,2	4,8	1,8	1,6	84	90,4
Stung SEN	8	29°40	29°40	6,8	6,9	34.560	34.560	10	6	368	674,4	292	545,6	13	13	12	12	3,2	3,2	2,0	3,3	76	128,8
Tonlé KRAMON	9	29°90	29°90	7,6	7,5	6.984	6.984	13	13	152	163,2	73,6	56,8	55	56	58	60	18,4	19,2	0,7	1,6	78,4	106,4
Face SNOC TROU	10	29°90	-----	7,5	---	7.704	-----	14	—	138,4	———	48	-----	51	--	54	—	16	———	0,7	—	90,4	———
Forêt inondée	11	-----	-----	6,9	---	8.640	-----	35	28	98,4	100,8	19,2	20,8	47	47	48	46	14,4	13,6	1,1	1,1	89,2	80

VARIATIONS DES CARACTERES PHYSICO-CHIMIQUES

VARIATION OF THE PHYSICO-CHEMICAL

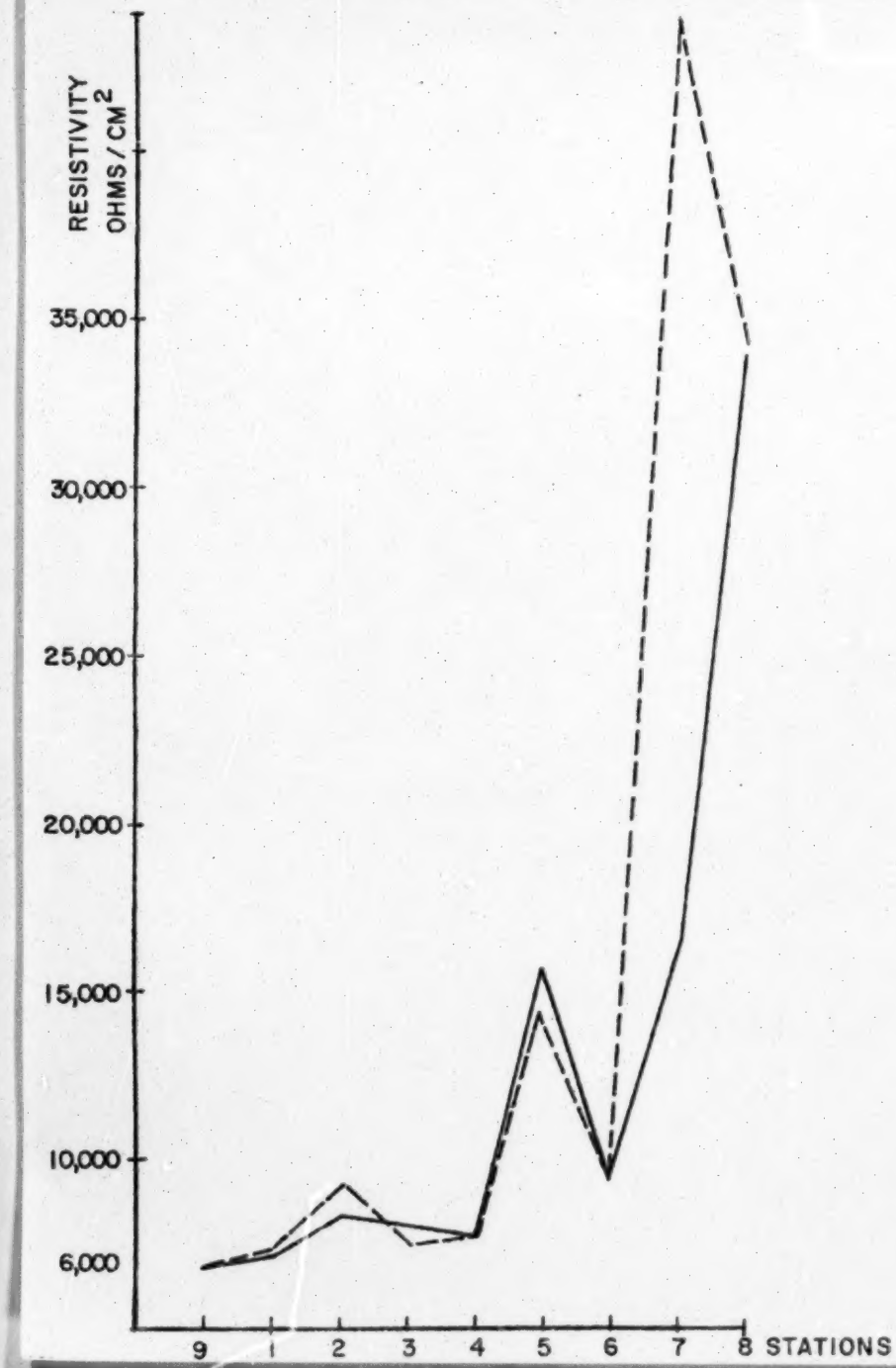
DES EAUX DU SEUIL DE SNOC TROU EN PERIODE

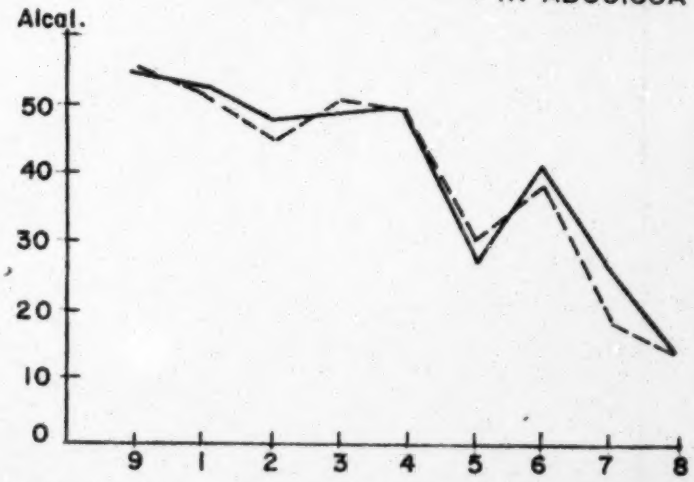
CHARACTERISTICS OF THE WATER OF THE

DE CRUE EN ABSCISSE

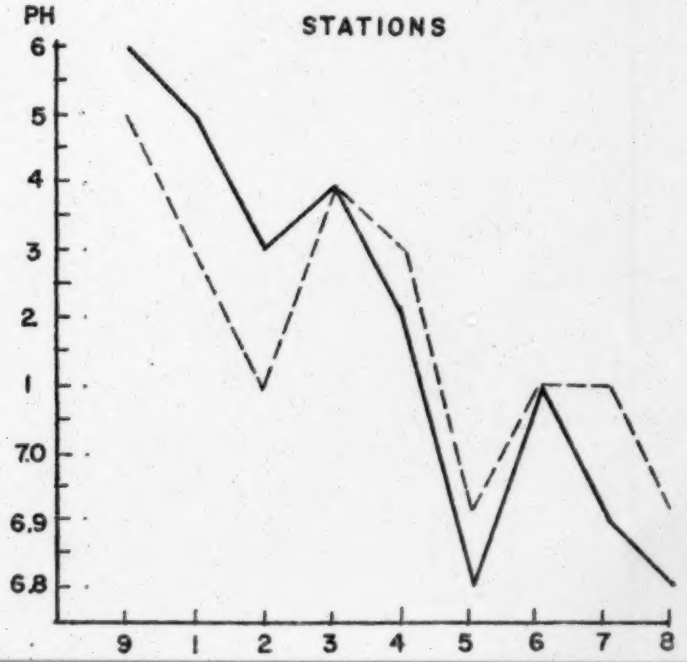
SNOC TROU BAR IN FLOOD PERIODS

IN ABSCISSA





1 PREK TASOM
2 " RATNAM
3 " RAT TU
4 " RAT BA
5 " RAT NHI
6 " RAT NHUT
7 " TAMEN
8 STUNG SEN
9 TONLE SAP



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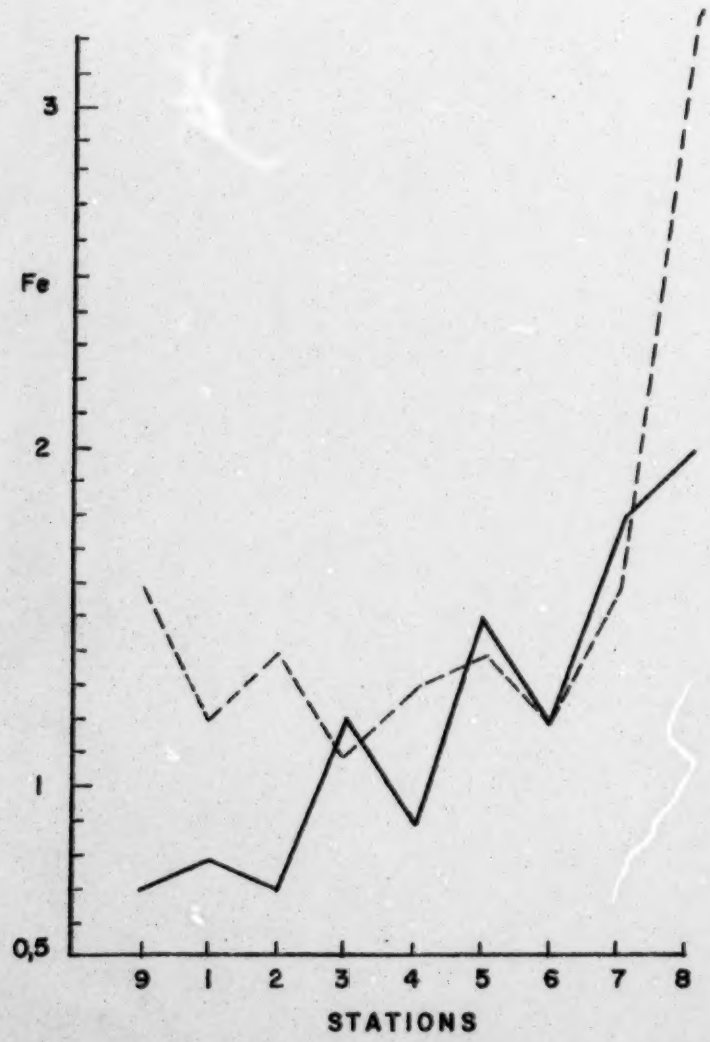

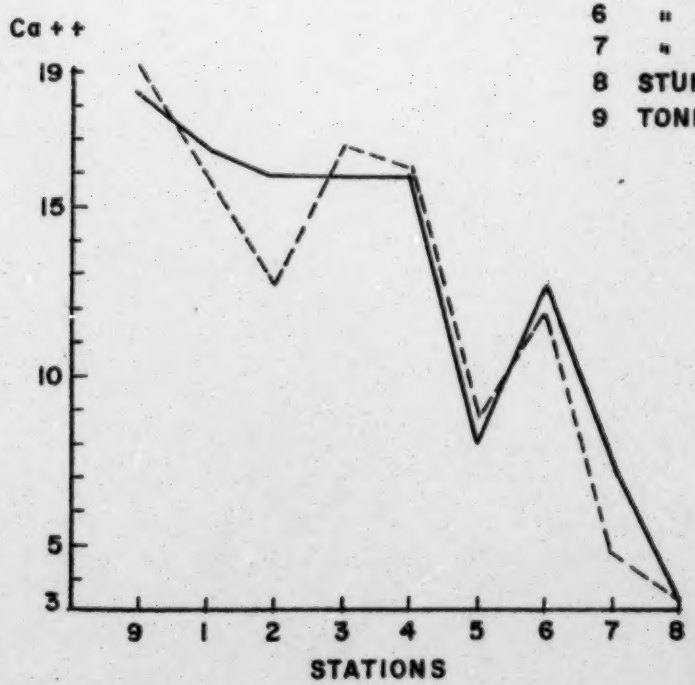

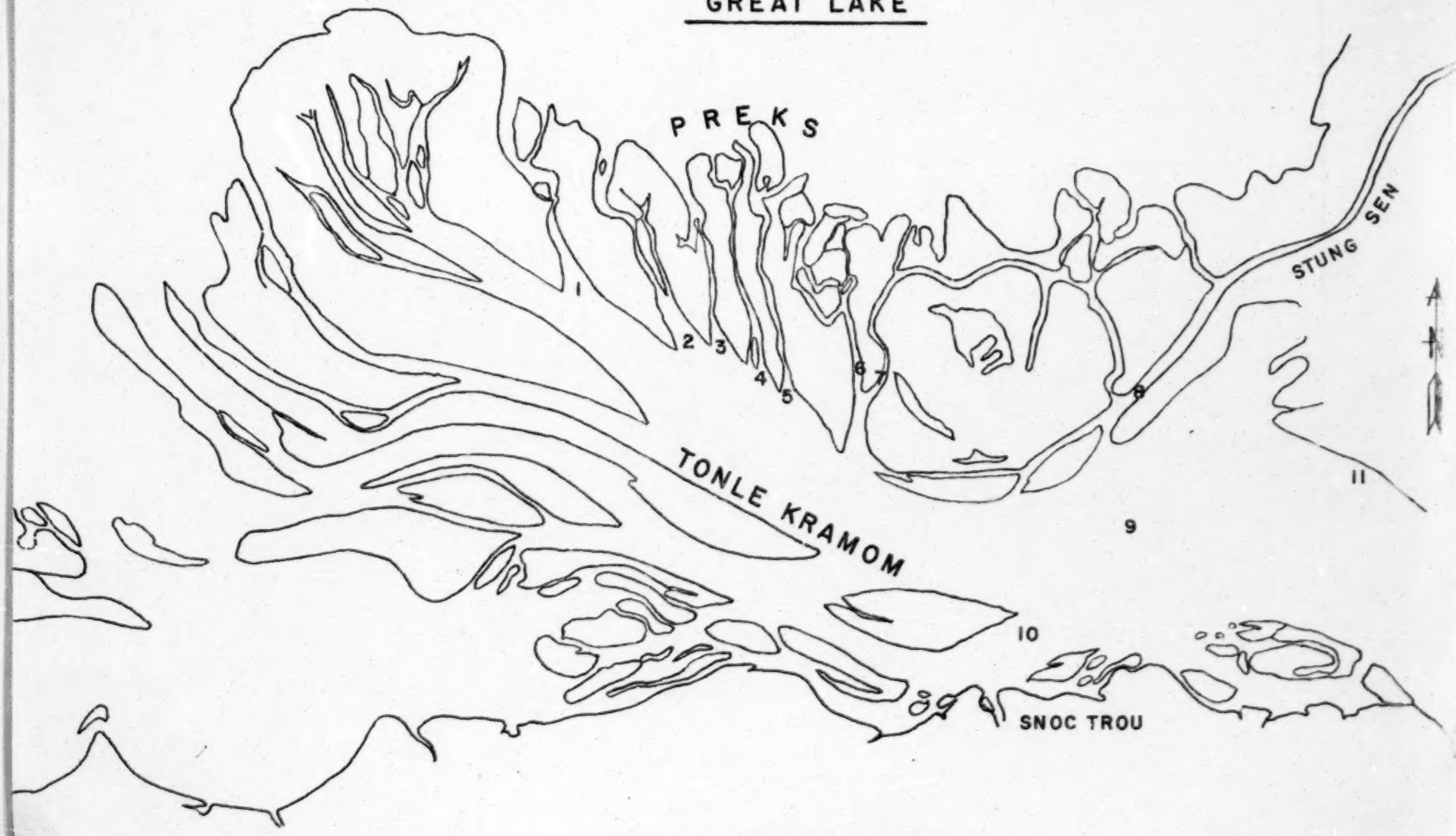

SEUIL DE SNOC-TROU

POINTS DE PRELEVEMENTS D'EAUX

WATER SAMPLING POINTS